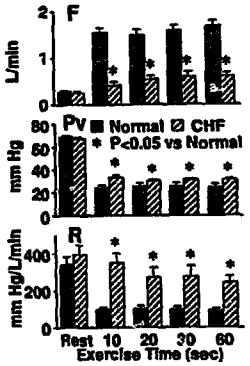
pump effect, creating *de novo* perfusion pressure and eliciting local reflex vasodilation. Thus, exercising legs may have a potent self-perfusion system, and this mechanism may be blunted in patients with chronic heart failure (CHF) because of an elevated central venous pressure. To test the hypotheses, we measured Doppler femoral artery blood flow (F), mean ankle vein pressure (Pv), and mean arterial pressure (Pa) during light bicycle EX at 3 mets in 10 normal subjects and 10 CHF patients. Leg vascular resistance (R) was defined as (Pa-Pv)/F. In normal subjects, F rapidly increased 5.3-fold immediately after onset of EX (Fig). Pv also rapidly declined by 44 ± 8 mm Hg. Hence, the leg perfusion pressure increased by 48%, although Pa remained unchanged. R rapidly decreased by 72% in parallel to the drop in Pv (Fig), suggesting that this response is mediated by veno-arteriolar reflex. Thus, leg blood flow normally increased at least 5-fold solely by the muscle pump-dependent mechanism, allowing for EX at 3 mets (*e.g.*, ordinary walking). The muscle pump-dependent flow response was limited in patients with CHF, due to a blunted drop in Pv and an attenuation of reflex vasodilation (Fig).

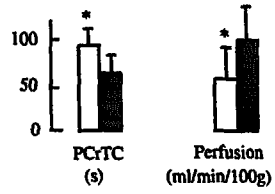


This abnormality may play an important role in pathophysiology of CHF, by decreasing EX capacity and by imposing an additional load on the failing heart.

1015-35 Interrelation of Oxidative Metabolism and Local Perfusion in Skeletal Muscle of Heart Failure Patients Demonstrated by NMR

J. François Toussaint, Todd M. Koelling, Chris J. Schmidt, Paul J. LaRaia, Kenneth K. Kwong, Howard L. Kantor. *Cardiac Unit, MGH, Boston, MA; CEA-SHFJ, Orsay, France*

Abnormalities of oxidative metabolism or perfusion have been demonstrated in skeletal muscle of heart failure patients (HFP), but not simultaneously measured. We developed two independent MRI approaches to measure local perfusion inside muscle groups. Using these non-invasive techniques, we previously demonstrated a relation between local perfusion and oxidative recovery after exercise (measured with ^{31}P-MR Spectroscopy: MRS) in normal soleus & gastrocnemius (S&G) muscles. We now test the hypothesis that post-exercise ATP resynthesis is related with maximal perfusion in HF muscle. In S&G muscles of 10 HFP and 7 age-matched healthy volunteers, we calculate the phosphocreatine recovery time constant (PCrTC) after ischemic foot plantar flexions using ^{31}P-MRS (1.5 Tesla, $\alpha = 60^{\circ}$, TR = 3 s, 4 averages, end-exercise PCr < 70% of rest PCr, recovery fitted for first order kinetics), and the perfusion rate (ΔF) using echo-planar MRI during reactive hyperemia (inversion-recovery, ΔF = Δ(1/T1 hyperemia-1/T1 rest) *k, where k is the water partition coefficient).



*Perfusion is significantly reduced in HF (white boxes in figure), while PCrTC is significantly increased as compared to age-matched controls (black boxes). *p < 0.05*

However, NYHA class II HFP have metabolism and perfusion comparable to controls, while class III and IV HFP have dramatically slowed recovery and reduced flows. We demonstrate a relation in HF muscle between maximal perfusion and PCrTC given by y = 89.4 –0.35 ×, r = 0.86, p = 0.02; a relation similar to what has been shown in normal muscle. Thus PCr recovery after ischemic exercise in calf muscles of HFP is highly correlated with local tissue perfusion.

1015-36 Symptomatic Improvement Following Correction of Secondary Mitral Regurgitation in End-Stage Cardiomyopathy: Intermediate Follow-Up

David S. Bach, Steven F. Bolling. *University of Michigan, Ann Arbor, MI*

Mitral regurgitation (MR) complicating dilated cardiomyopathy (DCM) contributes to left ventricular (LV) volume overload and congestive heart failure (CHF). This report describes intermediate-term clinical and echocardiographic outcomes for 17 consecutive patients with recurrent CHF undergoing mitral anuloplasty for severe MR complicating end-stage DCM. 12 men and 5 women age 63 ± 9 years with severe LV dysfunction (ejection fraction [EF] 19 ± 4%), severe MR and NYHA Class III (n = 1) or IV (n = 16) CHF despite aggressive medical therapy underwent surgical mitral reconstruction. There were no operative deaths and 5 deaths on 1.4 ± 0.3 (1.1 to 1.8) year follow-up (actuarial survival 80% [95% CI 71 to 89%]). Of 12 patients alive at follow-up (PostOp), all but one had symptomatic improvement; NYHA Class improved from 3.9 ± 0.3 pre-operatively (PreOp) to 2.0 ± 0.6 ($p < 0.001$). Diuretic requirements were lower for 7/12 (58%) and stable for the remaining 5. PostOp MR was absent or mild in 11 patients and moderate in 1. Quantitative echo/Doppler was used to compare PreOp and PostOp LV end-diastolic volume (EDV), diameter/length (D/L), EF, forward cardiac output (CO) and regurgitant fraction (RF) for change (Δ):

	EDV (cc)	D/L	EF (%)	CO (L/min)	RF (%)
PreOp	281 ± 86	0.82 ± 0.10	19 ± 3	3.3 ± 0.9	68 ± 14
PostOp	206 ± 88	0.74 ± 0.07	26 ± 8	5.2 ± 1.1	15 ± 14
Δ	−65 ± 33	−0.08 ± 0.07	+7 ± 5	1.9 ± 0.9	−53 ± 18
p	<0.001	0.005	0.008	0.001	<0.001

11 of 17 (65%) patients were alive and symptomatically improved at 1.4 ± 0.3 years post-op. LV volume and sphericity decreased; EF and forward cardiac output increased. Mitral reconstruction may be a viable new strategy for treatment of selected patients with severe MR complicating end-stage cardiomyopathy.

1016 Pathophysiology

Wednesday, March 27, 1996, Noon–2:00 p.m.
Orange County Convention Center, Hall E
Presentation Hour: Noon–1:00 p.m.

1016-37 Plasma Cardiac Troponin-T Levels: The Acute and Chronic Effects of Alcohol Toxicity

Vinood B. Patel[1], Roy Sherwood[1], Karen Poyser[1], Howard Why[2], Peter J. Richardson[2], Victor R. Preedy[1]. [1] *Department of Clinical Biochemistry, King's College Hospital, London, UK;* [2] *Department of Cardiology, King's College Hospital, London, UK*

Acute alcohol administration alters the synthesis of subcellular organelles, such as the mitochondria and causes reductions in cardiac contractile protein synthesis. The mechanisms are possibly related to some type of ischaemic event. Troponin-T (TnT) is part of the troponin complex found on the contractile apparatus and binds troponin to tropomyosin. During myocardial cell damage, such as ischaemia, TnT is released into the circulation. We measured circulating plasma cardiac troponin-T levels in acute and chronic alcohol rat models. In the acute alcohol model there were 4 groups; Group 1, Saline + Saline; Group 2, Saline + Ethanol; Group 3, Saline + Cyanamide; Group 4, Ethanol + Cyanamide. Cyanamide potentiates circulating acetaldehyde levels by inhibiting acetaldehyde dehydrogenase. The doses were, saline 0.15 mol/l; ethanol 75 mmol/kg body wt; cyanamide 0.5 mmol/kg body wt. The total treatment period was 3 hours, after which male Wistar rats were killed and plasma cardiac TnT was measured by enzyme immunoassay. The results showed a significant increase in plasma cardiac TnT levels in ethanol treated rats (+204%, $P < 0.025$). Cyanamide alone had no effect but with ethanol caused a 457% ($P < 0.001$) increase in TnT levels. In the chronic alcohol model, based on the Lieber-DeCarli diet, no significant differences were observed, indicating the development of tolerance. In conclusion, acute alcohol toxicity results in elevated circulating cardiac TnT levels which is exacerbated by raising acetaldehyde, suggesting that acute myocardial damage may arise as a consequence of ischaemia.